

Drainage Services Department

Specification For Gravity Sewer and Stormwater Drain Connections

1 Polyethylene Compounds

- 1.1 Polyethylene (PE) compounds used for the manufacture of PE pipe and fittings shall conform to BS EN 12201-1 ***“Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE)”***
- 1.2 In addition to clause 1.1, PE compounds used for the manufacture of pipe shall meet the requirements of PE100-RC as defined in Clause 3.1 of PAS 1075:2009-04 ***“Pipes made from Polyethylene for alternative installation techniques”***.
- 1.3 Compounds shall be 100% virgin, pre-coloured compounds. All compounds used in pipe (including striping and co-extrusion colour compounds) shall have the same brand name and be the same base compound. No reprocessed, recycled or own reprocessed materials shall be used in the manufacture of any pipe or fittings; Clause 4.1 of BS EN 12201-2 shall not apply.

2 Polyethylene Pipes

- 2.1 PE pipes shall conform to BS EN 12201-2: 2011.
- 2.2 For pipes with a burial depth to the top of the pipe less than or equal to 4m, PE pipes with a Standard Dimension Ratio¹ (SDR) of 17 shall be used. If the burial depth is greater than 4m, PE pipes with lower SDR shall be used. In this case detailed design calculations shall be submitted to the Chief Engineer/Hong Kong & Islands, Chief Engineer/Mainland South or Chief Engineer/Mainland North for approval.

Equivalent Size in nominal DN / ID²	200	225	250	300	375	450	550	600	700
PE (OD³) Size	225	250	280	355	400	500	630	710	800

- 2.3 PE pipes and fittings shall be black in colour and comply with the following additional requirements: -

- 2.3.1 Pipes shall have an internal co-extruded orange colour layer in accordance with BS EN 12201-2 Annex B. The internal colour shall be Orange with reference to BS 4800: 08 E 55 and thickness shall be 15% of the nominal pipe wall thickness⁴ around the entire internal circumference, with a tolerance of +/-1.5%. No delamination shall occur during all tests of the co-extruded pipe.

¹ Standard Dimension Ratio is the ratio of the pipe diameter to wall thickness (Pipe OD/SDR= min wall thickness).

² Nominal DN / ID is the numerical designation of the size of a component, which is a convenient round number, approximately equal to the Internal manufacturing dimension in millimetres (mm).

³ OD is the outside diameter of the pipe.

⁴ Nominal pipe wall thickness is the numerical designation of the pipe wall thickness, which is a convenient round number, approximately equal to the manufacturing dimension in millimetres (mm).

- 2.3.2 It is preferred to have an external indication striping to identify gravity sewer and Stormwater drain. Striping compounds shall meet all the requirements of Section 1.1 and 1.3 of this specification and shall be pre compounded, Brown with reference to BS 4800: 06 C 39 for sewer and Green with reference to BS 4800: 12 D 45 for Stormwater drain.
- 2.3.3 There shall be six or more indication stripes equally spaced around the circumference, each stripe shall be between 6-24mm wide.
- 2.3.4 All pipes shall have permanent and legible marking complying with requirements specified in BS EN 12201-2, Clause 11.

3 Polyethylene Fittings

- 3.1 PE Fittings, unless indicated otherwise in Sections 3.5 and 3.6 below, shall comply with BS EN 12201-3:2011 and shall be manufactured from PE100 compounds complying with Section 1.1 and 1.3 of this specification.
- 3.2 All fittings shall have permanent and legible marking complying with requirements specified in BS EN 12201-3, Clause 11.
- 3.3 Fabricated fitting welds shall be undertaken using butt fusion or side fusion following the principals of ISO 21307 ***“Plastics pipes and fittings -- Butt fusion jointing procedures for polyethylene (PE) pipes and fittings used in the construction of gas and water distribution systems”***. Internal weld beads in all fabricated fittings shall be removed, leaving the surface smooth and uniform without marks, gouging or any reduction in the wall thickness resulting from the bead removal process. External weld beads shall not be removed. Extrusion welding or any form of hand or filler welding is not permitted to be used in the construction of any PE fittings.
- 3.4 Puddle Flanges shall be either moulded or machined from a single piece of PE. No welds or joints shall be permitted in the construction of the puddle flange. The OD of the restraint flange ring shall be at least 1.25 x OD of the connecting pipe. The width of the puddle flange ring shall be 1.25 x wall thickness of the connecting pipe. The puddle flange spigots shall match the connecting pipe’s OD and SDR. The interface to the puddle flange ring shall be tapered at a length not less than 2 x puddle flange width. Puddle flange spigots shall match the connecting pipe’s OD and SDR and spigot lengths shall be greater than or equal to L2 from BS EN 12201-3 Table 3.
- 3.5 Transition fittings that connect PE pipes to pipes of other materials by rubber ring joint shall comply with requirements and testing specified in Clause 10 of BS EN 12666-1 ***“Plastics piping systems for non-pressure underground drainage and sewerage. Polyethylene (PE). Specifications for pipes, fittings and the system”***. Where the difference in the actual inside diameters between the two connecting pipes is greater than 5% of the pipe diameter, the transition shall be eccentric in design to maintain a level invert.
- 3.6 **Manhole connectors**
- 3.6.1 Type A manhole connectors shall be made using two components; a PE ring for casting into the manhole and a matching push in PE spigot connecting to the PE pipe to provide a flexible connection. The flexible connection shall have two elastomeric sealing rings and a hydrophilic expansion ring, which shall comply with the

requirements and testing specified in BS EN 12666-1, clause 10. A typical detail is given in Appendix A.

3.6.2 Type B manhole connectors shall incorporate a puddle flange as specified in Section 3.4 above with the addition of a hydrophilic seal as indicated in Appendix A.

3.7 Electrofusion Couplers

3.7.1 Electrofusion couplers shall comply with BS EN 12201-3 and have a SDR classification equal to, or less than the pipes that they are connecting to.

3.7.2 Fusion zone length 'L2' shall be a minimum of 1.5 x dimension L2 stated in BS EN 12201-3: Table 1.

3.7.3 Electrofusion couplers 355 OD and above shall have an external reinforcement system either built in or supplied with each coupler and used to prevent the coupler from expanding during the fusion cycle. Such reinforcement shall be greater than the width of both fusion zones and the centre cold zone and shall be maintained in position throughout the welding & cooling process.

3.8 Bends may be used up to a maximum of 45° in gravity sewer and storm water drain, shall have a radius greater than or equal to 4x pipe OD and manufactured from pipe complying with Sections 1 and 2 above. Bends less than or equal to 500 OD shall be formed from pipe, bends greater than 500 OD may be fabricated with each compound angle no greater than 18°. Bends used for vertical drops may have a radius less than 4x pipe OD but shall include a rodding point. Pipe may be laid curved during installation using a radius greater than or equal to 27x pipe OD. Bend spigot lengths and dimensions shall be suitable to EF or butt fusion jointing.

4 Type & Batch Testing

4.1 Type & batch testing shall be carried out in accordance with CEN/TS 12201-7 ***“Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE). Guidance for the assessment of conformity”***. Each test result shall be independently verified by a HOKLAS recognised independent authority.

4.2 The initial type tests or subsequent process verification tests shall not be more than 36 months old.

4.3 Pipe batch test reports shall include all test results required in CEN/TS 12201-7: 2014 Table 8 and in addition shall include;

- Geometrical characteristics provided for each pipe in the batch, these shall be linked to the compound certificate of analysis batch.
- OIT, note 'b' of table 8 shall also apply to the indication stripes
- Elongation, note 'd' of table 8 shall not apply, virgin materials shall be tested.
- Certificates of Analysis issued by the compound manufacturer for each compound used in each pipe batch shall be provided

4.4 Fittings batch test reports shall include all test results required in CEN/TS 12201-7: 2014 Table 9 and Table B.3.

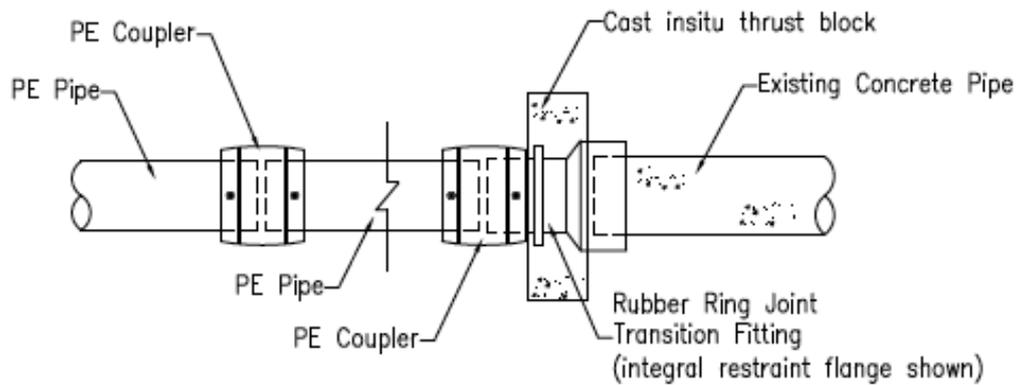
All test results shall then be submitted to the Chief Engineer/Hong Kong & Islands, Chief Engineer/Mainland South or Chief Engineer/Mainland North for record.

5 Employment of Qualified PE Pipe Layers

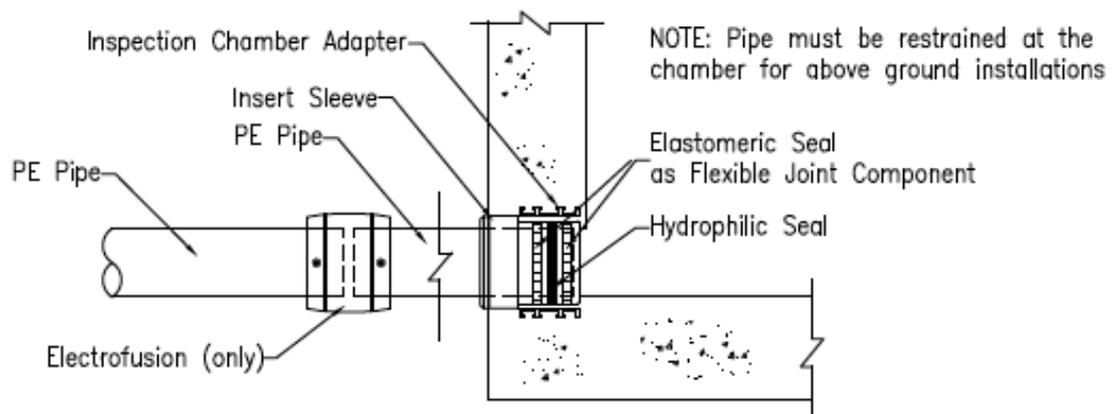
- 5.1 All connections or jointing of polyethylene pipe works must be carried out by qualified polyethylene pipe layers.
- 5.2 A qualified polyethylene pipe layer shall mean a worker who has successfully completed the courses “Installation of Polyethylene Pipes” or “The Installation and Application of Polyethylene (PE) Pipes” organized by the Hong Kong Institute of Vocational Education, or equivalent.
- 5.3 The records of the names and supporting documents of the qualified polyethylene pipe layers employed should be submitted to the Chief Engineer/Hong Kong & Islands, Chief Engineer/Mainland South or Chief Engineer/Mainland North for record.

6 CCTV inspection post installation

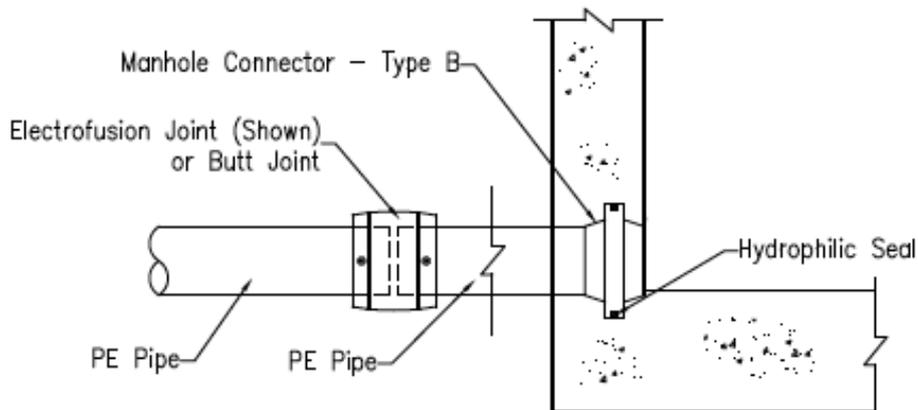
- 6.1 Gravity sewer and Stormwater drain pipes shall be CCTV inspected after backfilling in accordance with DSD’s CCTV requirement. Meterage of pipe installed shall correspond with the reordered length and the BRT for the pipe provided in clause 4.3 above.
- 6.2 The camera shall stop at each pipe joint, junction or transition to another material and provide a 360° rotation filmed around the joint to allow it to be inspected.
- 6.3 The recording from each chamber shall start showing the pipe end so that the pipe SDR can be confirmed.



Typical transition connecting PE to other pipe materials



Type A – Typical flexible connection for a PE Pipe to concrete Manhole Chamber



Type B – Typical rigid connection for PE Pipe to concrete Manhole Chamber

1	FIRST DRAFT		/
REV.	DESCRIPTION	SIGNATURE	DATE
DRAINAGE SERVICES DEPARTMENT			
REFERENCE		DRAWING No.	
SCALE	N. T. S.	(SHEET 1 OF 1)	

PE Connections